United States Patent [19]

Nelson

[11] **4,363,941**

[45] **Dec. 14, 1982**

[54] **PATCH MODULE**

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[73] Assignee: **Magnetic Controls Company**, Minneapolis, Minn.

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[51] **Int. Cl.**[3] **H01H 9/00**

[52] **U.S. Cl.** ..... **200/1 R**; 200/51.09; 200/51.1; 200/292; 307/112; 339/17 L

[58] **Field of Search** ..... 200/1 R, 1 A, 51 R, 200/51.01, 51.02, 51.03, 51.04, 51.05, 51.06, 51.07, 51.08, 51.09, 51.1, 51.11, 51.12, 51.13, 51.14, 51.15, 51.16, 51.17, 292; 307/112; 339/17 L, 18 R, 18 P; 361/352; 179/1 PC

[56] **References Cited**

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4,037,186	7/1977	Palmer et al.	200/51.1
4,140,918	2/1979	Lancaster	307/112
4,203,066	5/1980	Buck	324/51

Primary Examiner—A. T. Grimley

Assistant Examiner—Morris Ginsburg

Attorney, Agent, or Firm—Dorsey & Whitney

[57] **ABSTRACT**

A patch or access module usable with an insertable patch plug having a plurality of electrical contact elements. The patch or access module includes a circuit board, a first electrical circuit electrically connected with a first point on the circuit board, a second electrical circuit electrically connected with the second point on the circuit board and switch contact means for selectively making electrical connection between the first point and the second point and for making electrical connection between the first point and the electrical contact elements of the patch plug upon insertion of the patch plug into the patch or access module. The switch contact mechanism includes a first portion electrically engaged with the first point, a second portion adapted for selective electrical engagement with the second point and a third portion adapted for limited movement relative to the circuit board for electrical engagement with the electrical contact element of the patch plug when the plug is inserted into the patch module.

16 Claims, 16 Drawing Figures

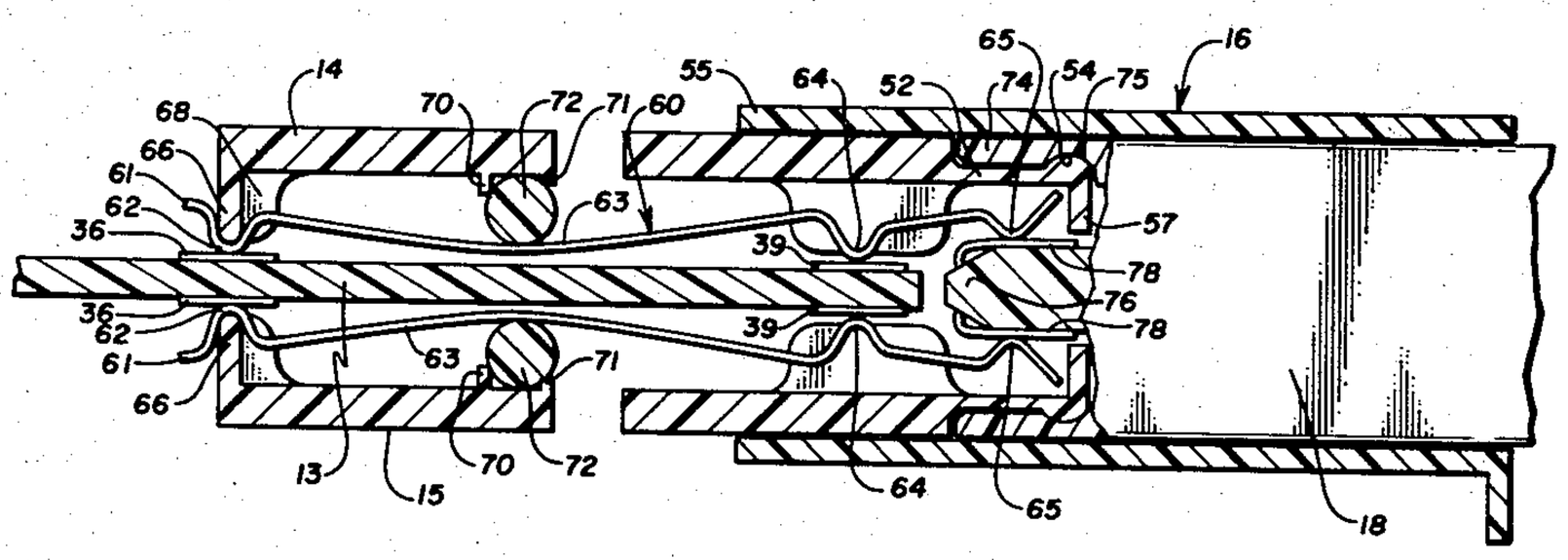

Fig. 1

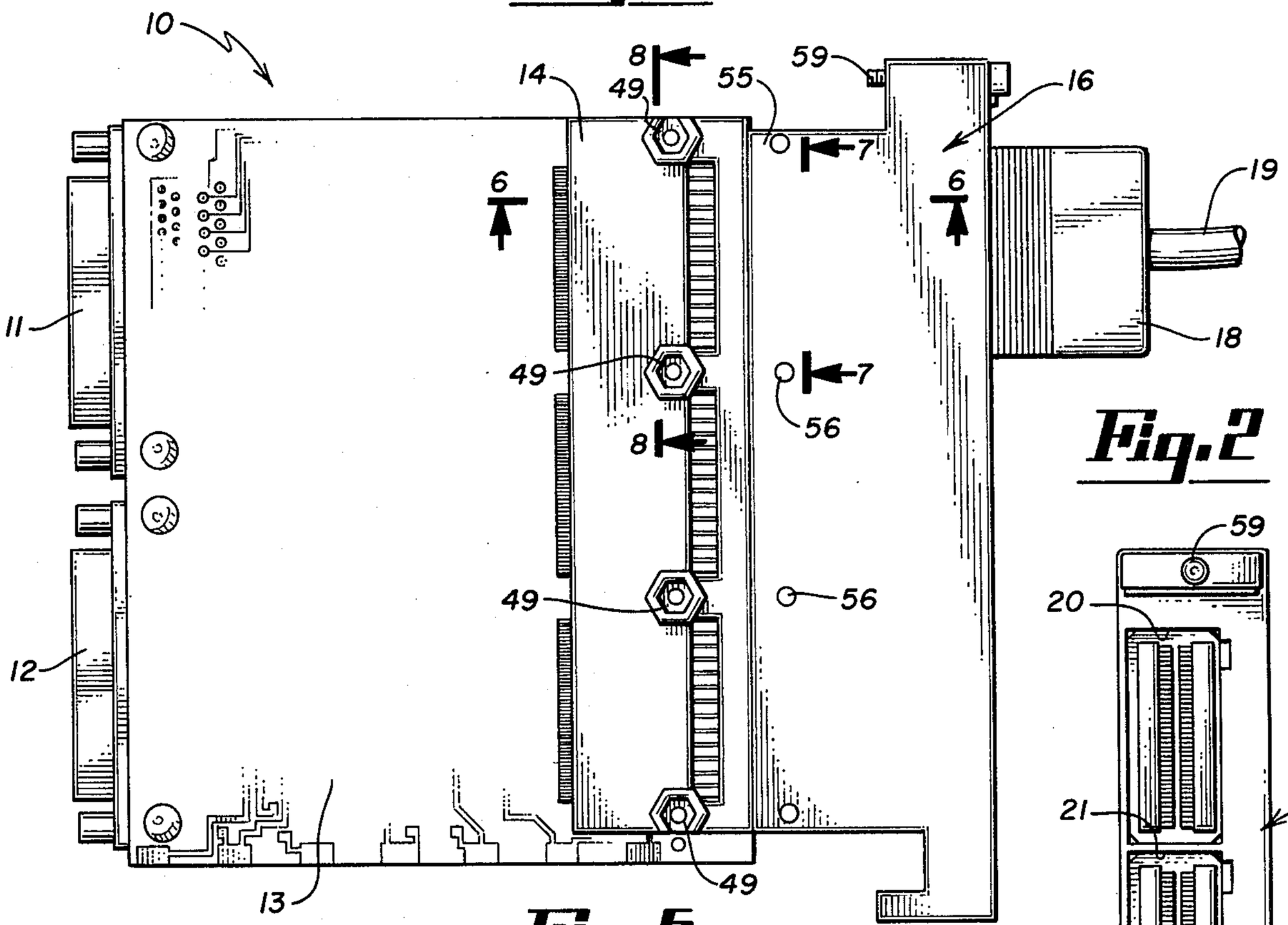

Fig. 2

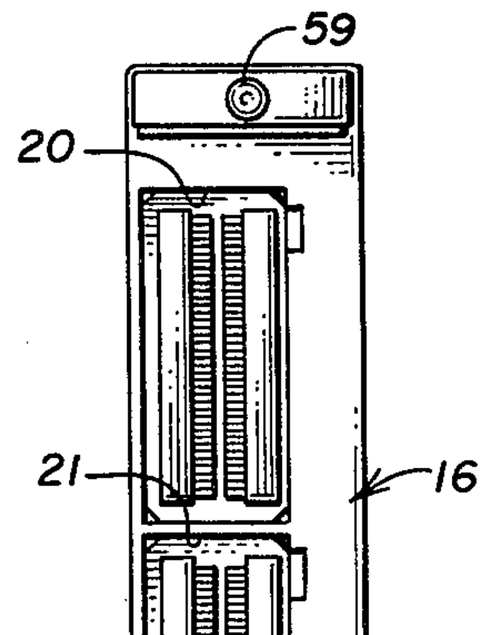

Fig. 5

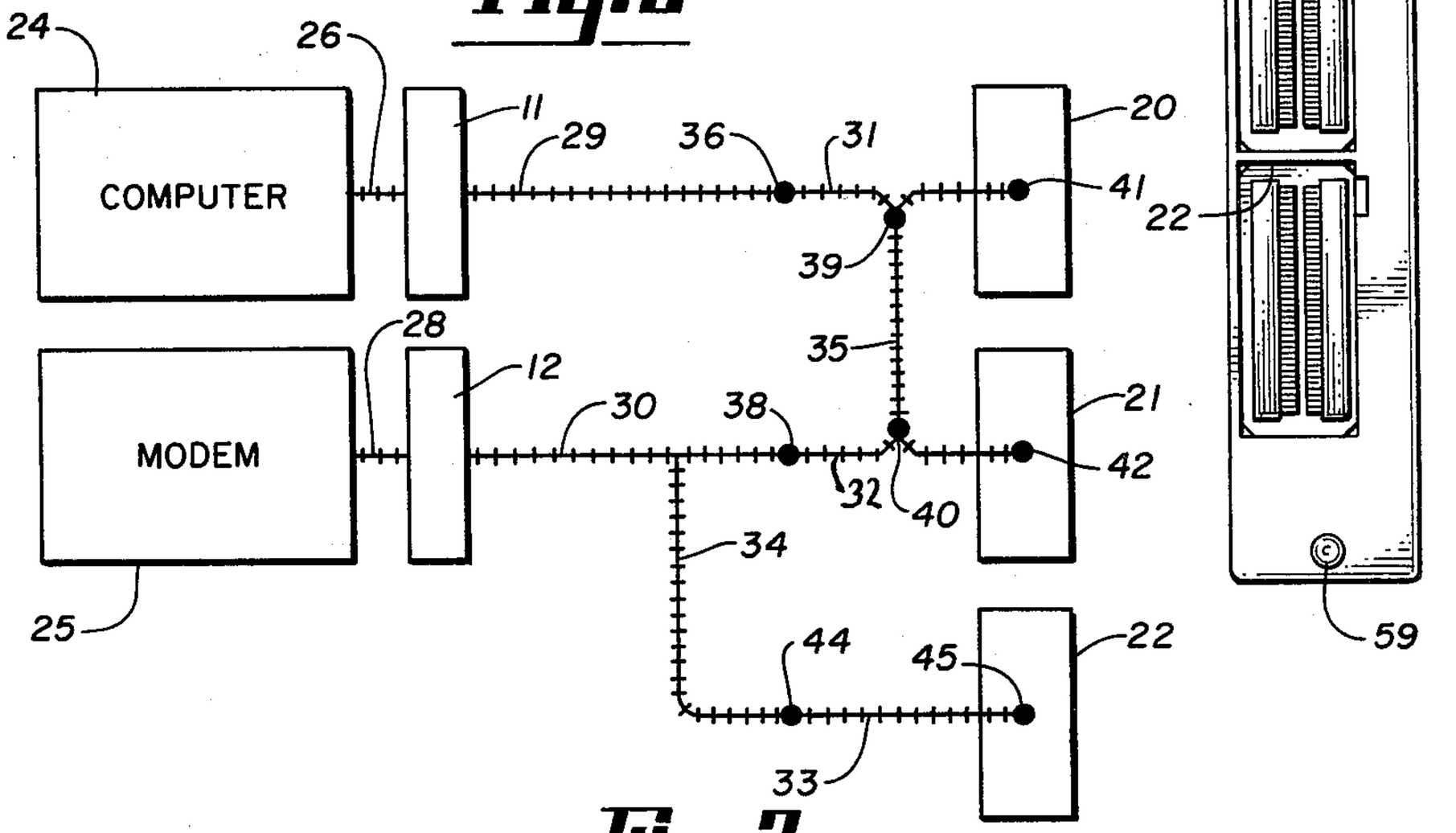

Fig. 3

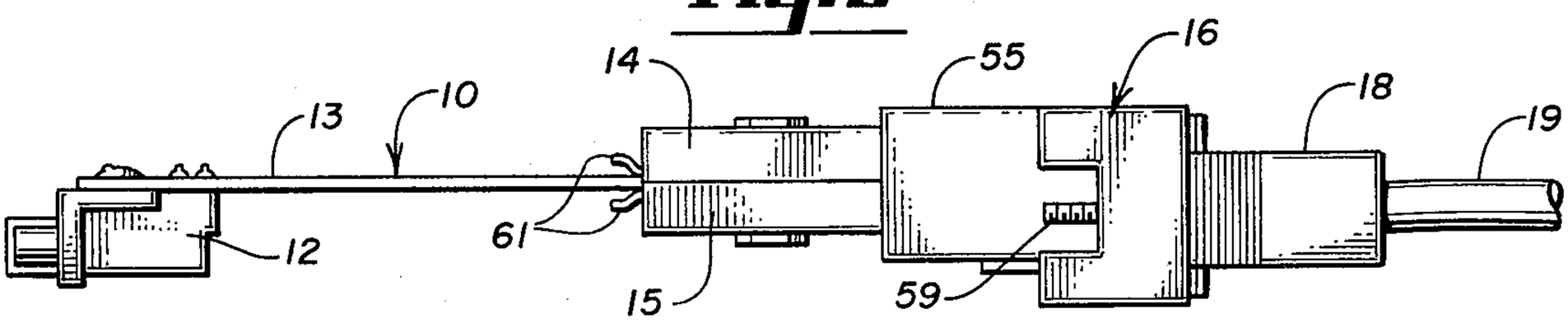

Fig. 4

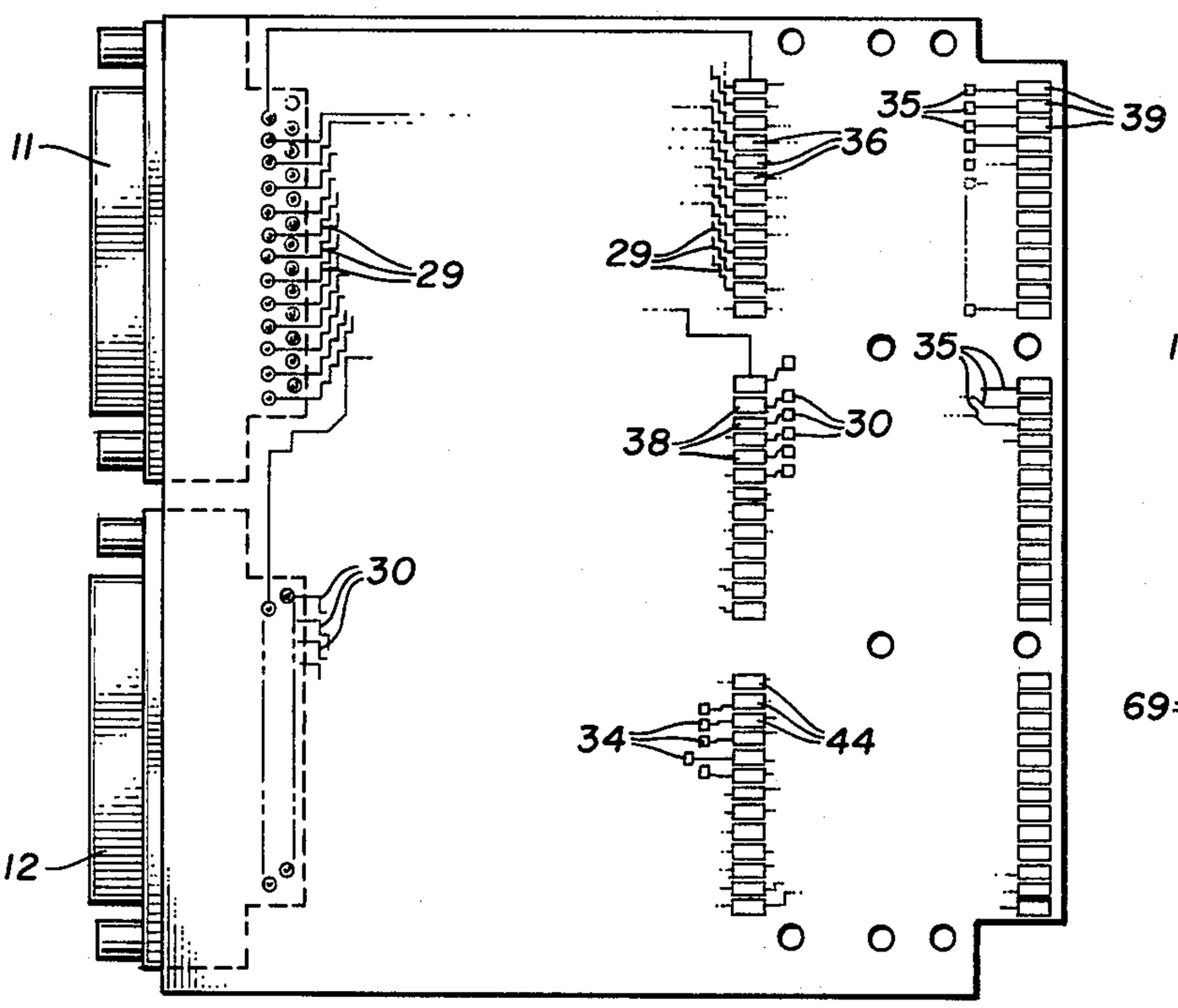

Fig. 7

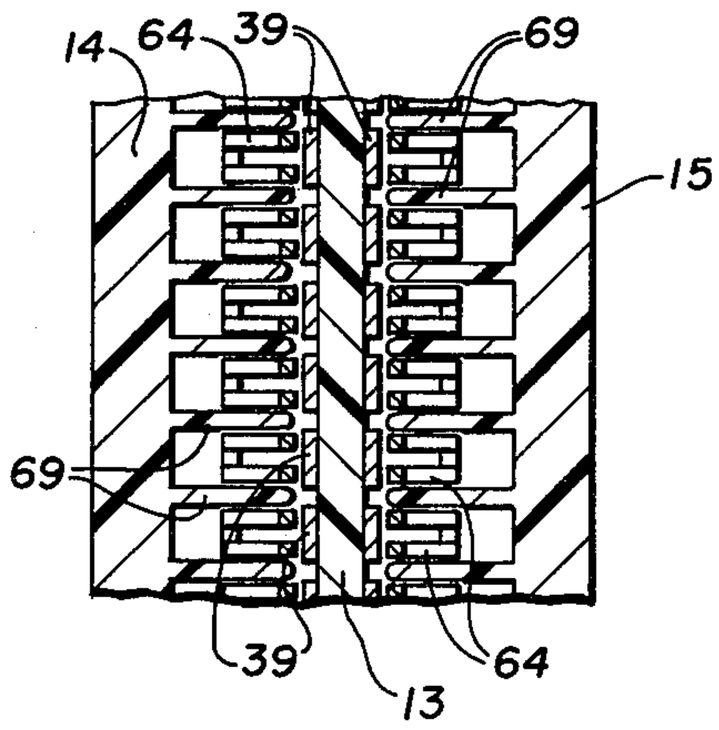

Fig. 9

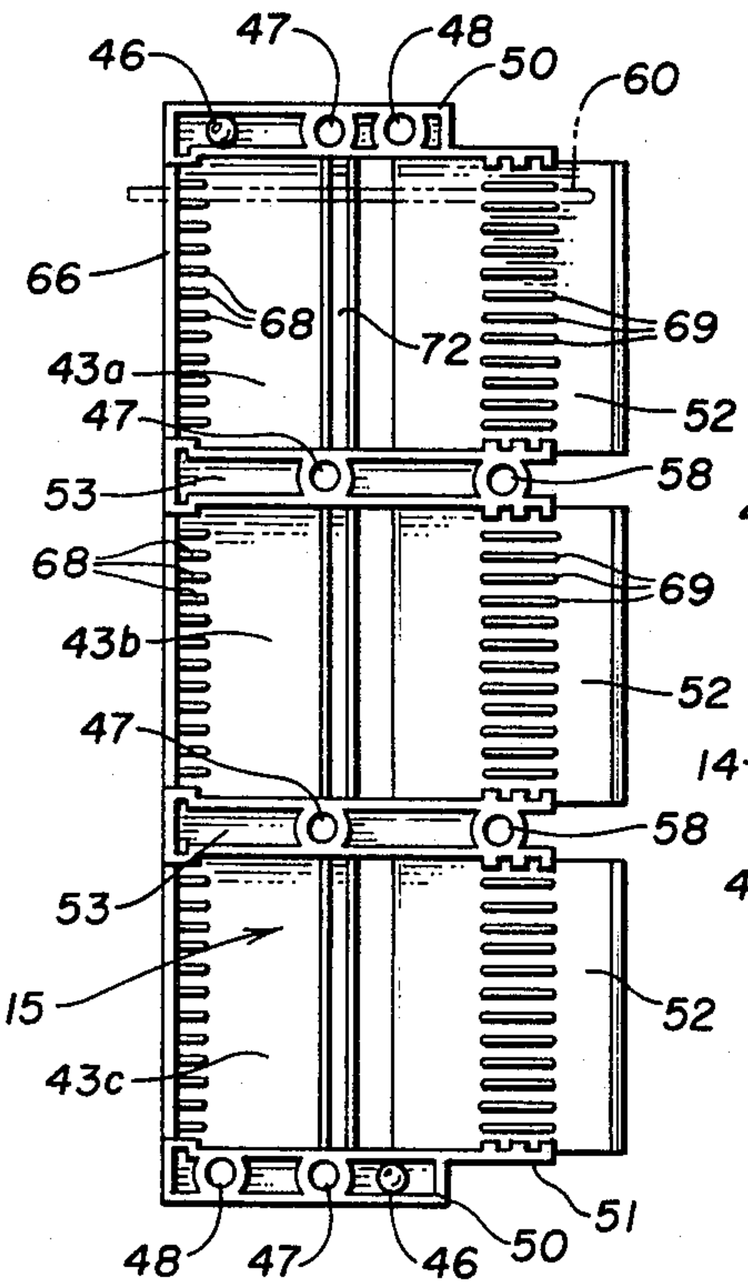

Fig. 10

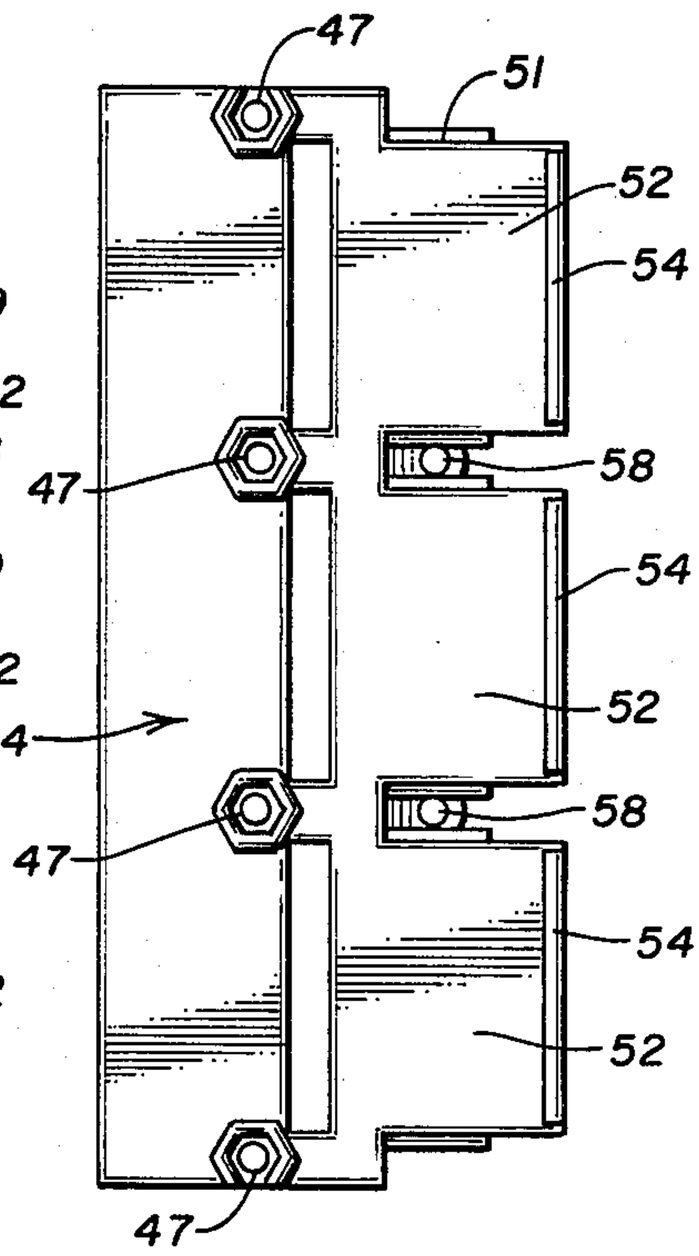

Fig. 13

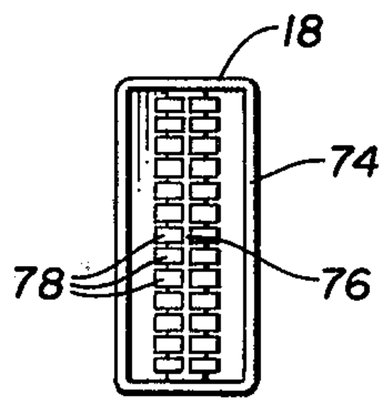

Fig. 6

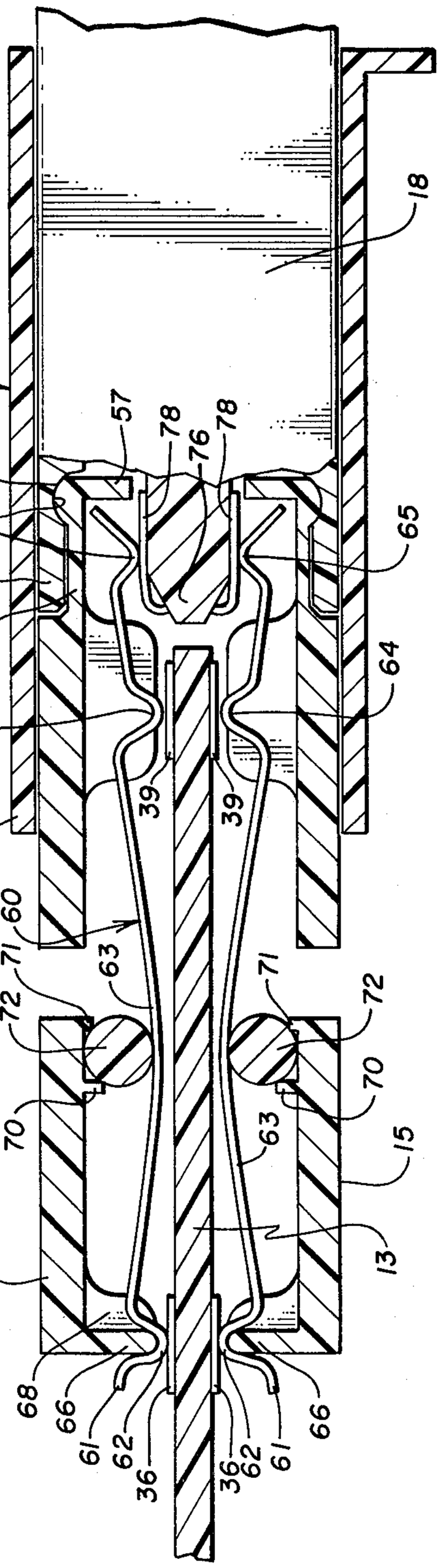
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Fig. 6A

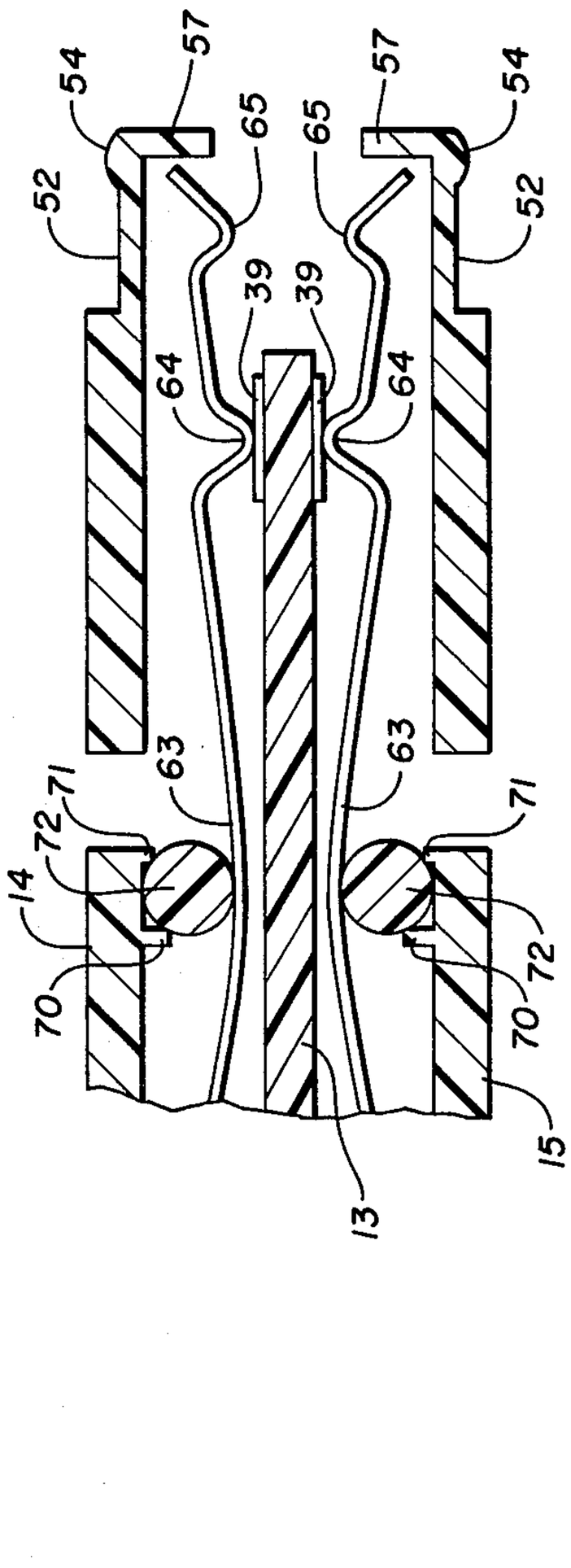
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Fig. 8

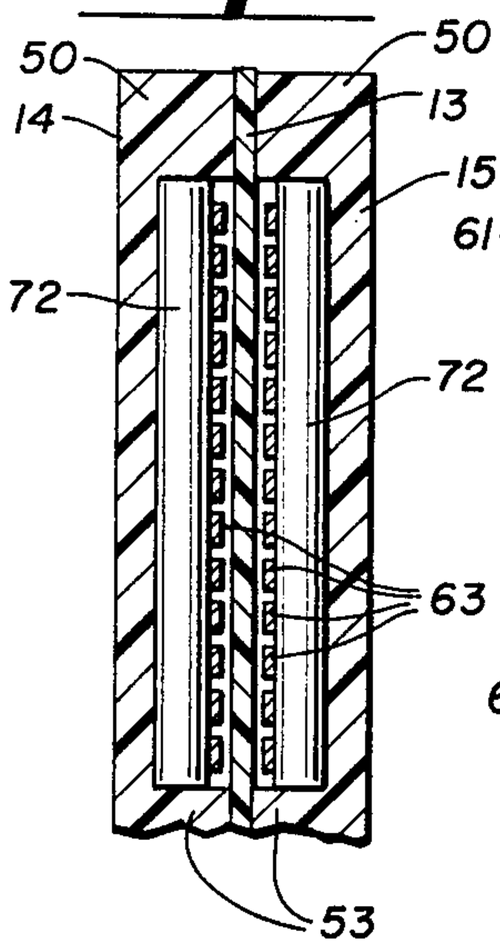


Fig. 11

Fig. 12

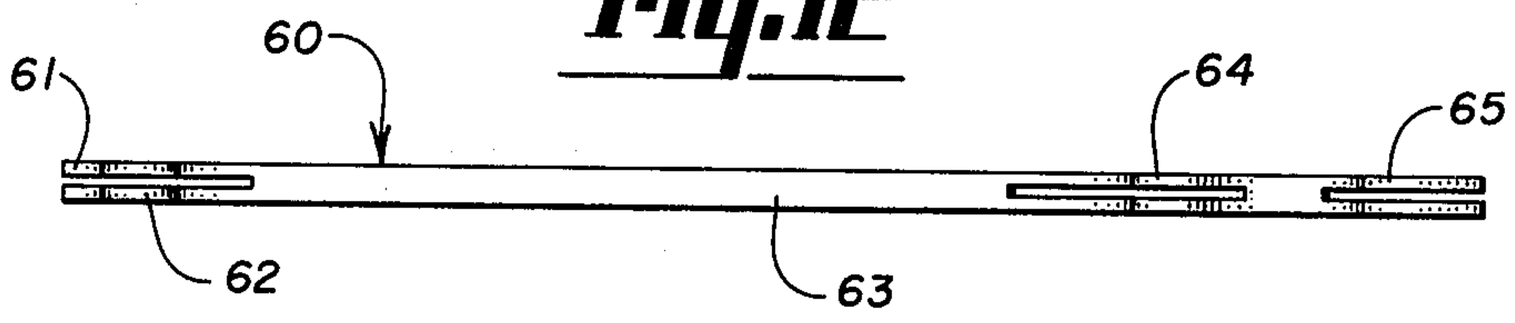


Fig. 14

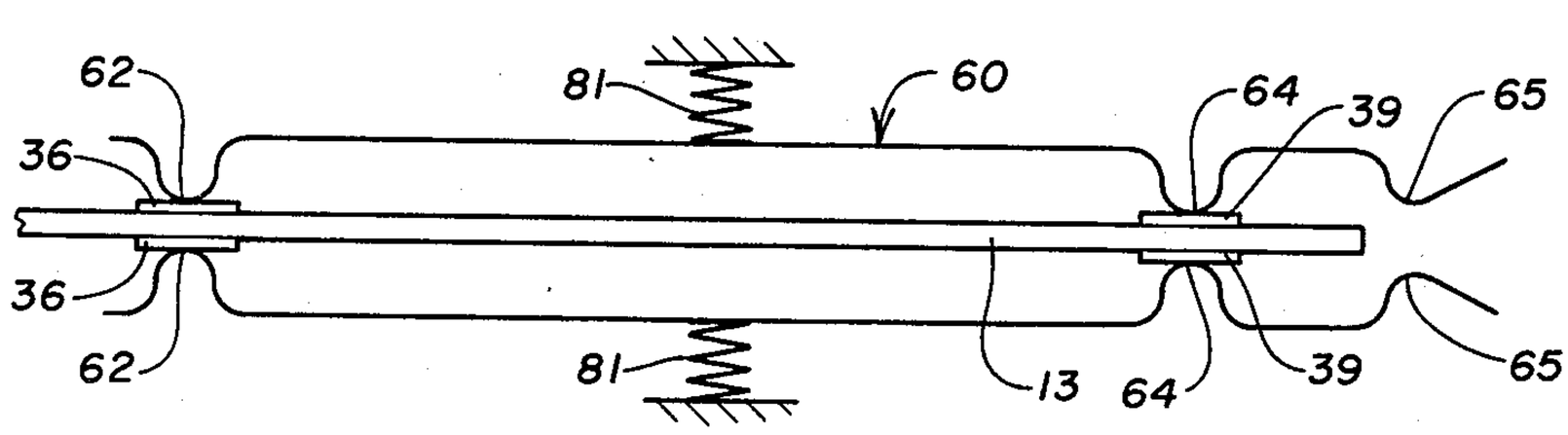
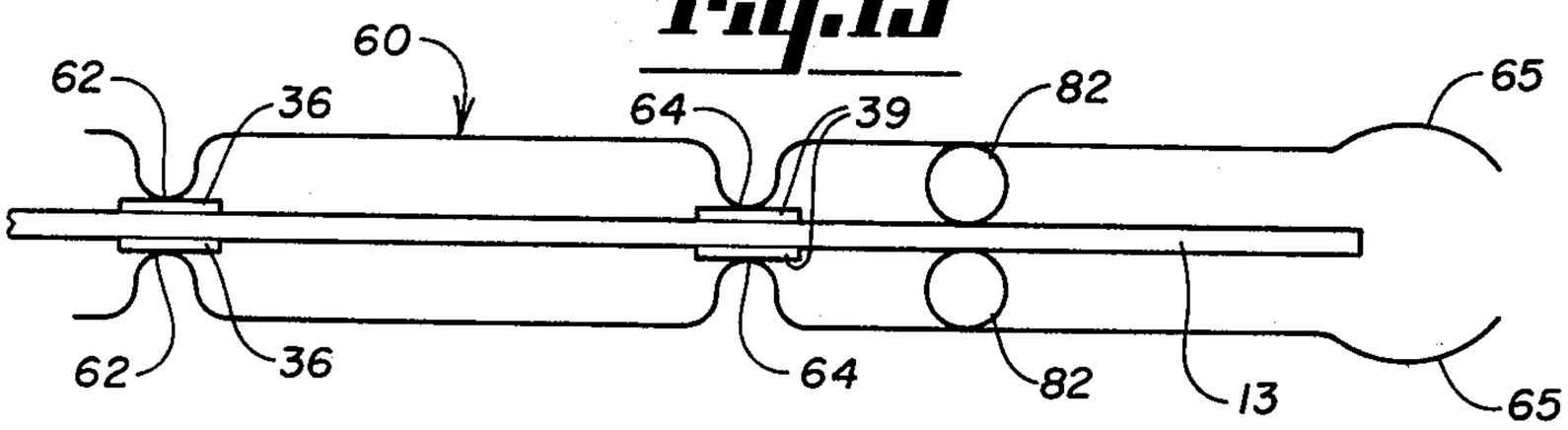


Fig. 15



PATCH MODULE

BACKGROUND OF THE INVENTION

The present invention relates generally to a patch or access module usable with an insertable patch plug, and more particularly, to an improved switch and contact element in a patch module for electrically connecting or accessing certain leads of a data transmission circuit to a patch cord and electrically disconnecting such leads from their normal electrical connection within the patch module.

Several types of patch or access assemblies presently exist in the prior art. Such assemblies typically include an array of individual patch or access modules disposed in side by side relationship with one another. In these assemblies, each module is adapted for selectively connecting and disconnecting various electrical circuits or leads within the module. In one embodiment, each of the patch modules includes an access to the leads on the computer side of a data transmission circuit and an access to the leads on the modem side of a data transmission circuit. The respective leads from the computer are normally electrically connected with the leads on the modem side, thus providing a through circuit. Patch cords are available for use with the patch modules to electrically connect or patch one set of leads from a particular computer with a second set of leads for a particular modem remote from the particular module in question. Each of these patch cords includes a patch plug on opposite ends for making electrical connection with or accessing the respective computer and modem leads.

To accomplish the above patching function, the patch plug at one end of the patch cord is inserted into an access opening associated with the desired computer data transmission leads and the patch plug at the other end of the patch cord is inserted into the access opening associated with the desired modem data transmission leads. The insertion of the patch plugs into the patch modules accomplishes two things: (1) it causes the normal electrical connection between the computer and modem leads in a particular patch module to be electrically disconnected and (2) it causes electrical connection to be made between the leads being accessed and the corresponding contact elements in the patch plug.

A variety of mechanisms presently exist in the prior art for accomplishing this switching and contact function. In U.S. Pat. No. 4,140,918, the patch plug consists of a generally cylindrical element having a plurality of electrical contacts in which the switching and contact functions are performed by inserting the cylindrical plug into the patch module jack and rotating the plug. In U.S. Pat. No. 4,203,066, the switching function is accomplished by shifting the position of an entire switching board as the patch plug is inserted, with the electrical contact being made as a result of engagement between electrical contacts on the patch plug and contact portions on the surface of the printed circuit board. In another known structure, a plurality of contact springs are utilized with each of the springs associated with one of the leads. As the patch plug is inserted, the spring contact members are electrically disconnected from the leads and electrical contact is made between appropriate contacts in the patch plug and contact portions on the surface of the printed circuit board.

While many of the prior art patch modules and switch-contact mechanisms perform satisfactorily, they do have certain limitations. In many, the switching mechanism is structurally quite complicated, thus leading to high costs in manufacture and fabrication as well as increased chances of malfunction. Also, the contact mechanism in most modules consists of a contact element in the patch making electrical contact with a contact surface on the printed circuit board. This latter structure results in two disadvantages. First, because of the extremely high wear in the area where electrical contact is made, the anticipated useful life of the module is limited. Second, as a result of the continuous wear between the contact elements of the patch plug and the contact surfaces on the printed circuit board, fiber from the printed circuit board is dislodged, thereby resulting in intermittent circuits being formed. This often leads to malfunction of the module.

Accordingly, there is a real need in the art for a patch module having an improved switching and contact mechanism for substantially reducing or eliminating wear between the contact elements associated with the patch plug and the printed circuit board.

SUMMARY OF THE INVENTION

In contrast to the prior art, the present invention provides a patch or access module with an improved switch-contact means. This means includes means for switching or electrically disconnecting the normally connected computer and modem leads and means for making electrical contact between the desired leads in the patch module and the patch plug in a way which significantly reduces the wear normally occuring during such electrical connection.

More specifically, the switch and contact mechanism of the present invention includes a switch and contact element having a first or contact portion for electrical engagement with a first contact point on the printed circuit board, a second or switch portion normally electrically engaged with a second contact point on the printed circuit board and a third or contact portion spaced from the printed circuit board and adapted for electrical connection with a corresponding contact element in the patch plug. The mechanism is constructed such that the third portion is adapted for limited movement either toward or away from the printed circuit board upon insertion or withdrawal of the patch plug. Such movement of the contact portion causes corresponding movement of the second or switch portion out of electrical engagement with the second contact point on the printed circuit board. This particular construction results in reduced wear which is normally present when electrical contact is made between contacts on the patch plug and contact pads or portions directly connected with the surface of the printed circuit board.

In the preferred embodiment of the present invention, the switch and contact mechanism includes an elongated spring member having a circuit board contact portion in electrical contact with one of the computer or modem leads, a switch portion normally engaged with a contact pad on the printed circuit board and a contact portion spaced from the printed circuit board and adapted for engagement with a corresponding contact portion on the patch plug. The spring member is stressed to insure normal electrical engagement between the circuit board contact and switch portions with their corresponding contacts on the printed circuit

board. As the patch plug is inserted, the patch plug contact portion is moved outwardly with respect to the printed circuit board by its corresponding contact portion of the patch plug, thus causing disengagement between the switch portion and its corresponding contact on the printed circuit board.

Accordingly, a primary objective of the present invention is to provide a patch module having an improved switch and contact mechanism.

Another object of the present invention is to provide an improved switch and contact mechanism for a patch module in which the wear normally present in such devices is substantially reduced or eliminated.

A further object of the present invention is to provide an improved switch and contact mechanism for a patch module having a contact portion spaced from and adapted for limited movement relative to the printed circuit board upon insertion of the patch plug.

Another object of the present invention is to provide a switch and contact mechanism for a patch module in which the switch portion is electrically disconnected from its corresponding contact on the printed circuit board as a result of the above-described movement of the contact portion.

These and other objects of the present invention will become apparent with reference to the drawings, the description of the preferred embodiment and the appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is an elevational side view of a patch or access module with a patch plug inserted into the access opening accociated with the computer.

FIG. **2** is an elevational end view of the patch or access module shown in FIG. **1** with the patch plug removed.

FIG. **3** is an elevational top view of the patch or access module shown in FIG. **1** with a patch plug inserted therein.

FIG. **4** is an elevational side view of the printed circuit board of the patch module of the present invention.

FIG. **5** is a schematic circuit diagram of the patch module of the present invention.

FIG. **6** is a view, partially in section, as viewed along the section line **6—6** of FIG. **1**.

FIG. **6***a* is a view similar to FIG. **6** with the patch plug removed.

FIG. **7** is a view, partially in section, as viewed along the section line **7—7** of FIG. **1**.

FIG. **8** is a view, partially in section, as viewed along the section line **8—8** of FIG. **1**.

FIG. **9** is an elevational view of the inside portion of one of the side housing members showing the switch-contact elements in phantom.

FIG. **10** is an elevational view of the opposite side of the side housing member shown in FIG. **9**.

FIG. **11** is an elevational side view of one of the switch-contact elements of the present invention.

FIG. **12** is an elevational top view of one of the switch-contact elements of the present invention.

FIG. **13** is an elevational end view of the patch plug adapted for use with the patch module of the present invention.

FIG. **14** is a schematic view of an alternate embodiment of a switch-contact mechanism of the present invention.

FIG. **15** is a schematic view of a further alternate embodiment of a switch-contact mechanism of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The patch or access module within which the switch-contact mechanism of the present invention is embodied is illustrated generally in FIGS. **1**, **2** and **3** by the reference numeral **10**. As shown in FIGS. **1** and **3**, the patch module **10** includes a printed circuit board **13**, a pair of rear connectors **11** and **12**, a pair of side retainers or housing sections **14** and **15** disposed on opposite sides of the printed circuit board **13** and a forward end section **16** encircling a portion of the housing members **14** and **15**. The end section **16** includes a portion disposed forwardly of the printed circuit board **13**. The end view of the patch module **10** illustrated in FIG. **2** shows the forward end section **16** as including three access openings **20**, **21** and **22** associated with leads for computer, modem and monitor function, respectively. The access openings are adapted for insertion of a patch plug **18** (FIGS. **1** and **3**).

In the preferred embodiment as illustrated in the schematic illustration of FIG. **5**, a piece of local equipment **24** which in some cases may be a computer is connected over a multi-wire line **26** to the connector **11** at the rear of the patch module. The multi-wire line **26** may consist of any number of individual wires, but generally consists of at least twenty-four or more wires or leads. Similarly, in the preferred embodiment, a modem **25** is connected by a multi-wire line **28**, to the connector **12**. As with the line **26**, the line **28** may consist of any number of wires or leads, but usually consists of at least twenty-four or more. The modem **25** is normally connected to a common carrier or other communications line by which information or signals can be transmitted to and from the modem **25**.

Within the patch module, the leads from the connector **11** are conncted via the multi-wire line **29** and the multi-connector element **31** to the multiple contact points **39**. Similarly, the leads from the connector **12** are connected via the multi-wire line **30** and the multi-connector element **32** to the multiple contact points **40**. The contact points **39** and **40** are electrically connected by the multi-wire line **35**. Each of the multi-wire lines **29**, **30** and **35** represent a plurality of printed leads on the printed circuit board **13** (FIG. **4**) while each of the multi-connector elements **31** and **32** represent a switch-contact element of the type illustrated in FIGS. **11** and **12** and which will be described in greater detail below. When the multi-connector elements **31**, **32** are in their normal position as illustrated schematically in FIG. **5**, the multi-wire line **29** is electrically connected with the multi-wire line **30**, thus electrically connecting the computer **24** with the modem **25**. As will be discussed in more detail below, when a patch plug **18** (FIG. **1**) is inserted into either the computer access opening **20** or the modem access opening **21** (FIG. **2**), electrical engagment is made between the patch plug contacts and the respective contacts **41** and **42** at the ends of the switch-contact elements **31** and **32**. This in turn causes the elements **31** or **32** to be disengaged from their respective contact points **39** or **40**, thus providing access to either the computer **24** or the modem **25** by the patch plug **18**.

In the patch module of the preferred embodiment, a multi-wire line **34** is also electrically connected between

the multi-wire line **30** and the contact point **44**. The contact point **44** is in turn connected with the multi-connector element **33** to provide monitor access at the opening **22** (FIG. **2**).

An elevational view of one side of the printed circuit board **13** is illustrated in FIG. **4**. As shown, each of the wires or leads **29** from the connector **11** is electrically connected with a first equipment contact pad or portion **36** on the surface of the printed circuit board **13**. A second equipment contact pad or portion **39** corresponding to each of the pads **36** is disposed on the surface of the printed circuit board **13** in a position spaced forward from the first set of contact pads **36**. Similarly, each of the wires or leads **30** from the connector **12** is electrically connected with a first modem contact pad or portion **38** on the surface of the printed circuit board **13**. A second modem contact pad or portion **40** corresponding to each of the pads **38** is disposed on the surface of the printed circuit board **13** in a position spaced forward from the first set of pads **38**. The second set of contact pads **39** is electrically connected with the second set of modem contact pads **40** by a plurality of wires or leads **35**.

A plurality of monitor contact pads or portions **44** are disposed on the surface of the printed circuit board **13** and are electrically connected with the leads **30** via the leads **34**. With this construction, the data transmission circuit between the computer and modem connectors **11** and **12** can be monitored without interruption of the circuit. It should be noted that in the preferred embodiment, each of the contact pads **36, 38, 39, 40** and **44** comprises a gold plate contact pad secured to the surface of the printed circuit board **13**. The opposite side of the printed circuit board **13** (not shown) includes a similar construction of multiple wire leads and contact pads.

As illustrated best in FIGS. **1** and **3** and FIGS. **9** and **10**, the housing members **14** and **15** are adapted for positioning on opposite sides of the printed circuit board **13**. Each of the housings **14** and **15** includes a pair of edge portions **50, 50** and a pair of intermediate portions **53, 53** having a surface adapted for face-to-face engagement with one side of the printed circuit board **13**. The edge portions **50, 50** each include an alignment post **46** extending outwardly therefrom to properly position the housing members **14** and **15** with respect to the printed circuit board **13**. Each of the alignment posts **46** extends through a corresponding opening in the printed circuit board and into a corresponding recess portion **48** in the other housing member. The members **14** and **15** are retained together by a plurality of threaded members **49** (FIG. **1**) extending through the holes **47** (FIGS. **9** and **10**).

Each of the housing members **14** and **15** also includes a reduced neck portion **51** around which a rearward portion **55** of the end section **16** is disposed and three latching end sections **52** disposed forwardly of the neck portion **51**. The latching end sections **52** correspond to three bays or sections **43***a*, **43***b* and **43***c* of the housing members **14** and **15** which are defined by the edge and intermediate portions **50, 50, 53** and **53**. As shown in FIG. **10**, each of the forward latching ends **52** includes an integral latching rib **54** for engagement with a portion of the plug member **18** (FIG. **1**) when inserted.

A plurality of forwardly positioned ribs **69** are disposed in each of the bays **43***a*, **43***b* and **43***c* for retaining a plurality of switch-contact elements **60** in alignment with the various contact pads on the surface of the printed circuit board **13**. As shown in FIG. **7**, the ribs **69** also electrically insulate adjacent members **60** from each other. Each bay **43***a*, **43***b* and **43***c* also includes a rearward edge **66** and a plurality of tabs or ribs **68**. As illustrated best in FIG. **6**, the rearward edge **66** limits longitudinal movement of the member **60** with respect to the housings **14** and **15**. The ribs **68**, similar to the ribs **69**, function to properly align the elements **60** with respect to corresponding contact pads on the printed circuit board and to electrically insulate adjacent switch-contact members **60** from one another.

With reference to FIGS. **1, 2** and **3**, the forward end section **16** is of unitary construction having a rearward portion **55** encircling the neck portion **51** of the members **14** and **15**. The forward end of the section **16** includes three access openings **20, 21** and **22** to provide electrical access to the leads associated with the computer, modem and monitor function, respectively. The rearward portion **55** of the end section **16** slides over and encircles the neck section **51** of the members **14** and **15** and is secured thereto by a pair of screws **56** (FIG. **1**) extending through the holes **58** (FIGS. **9** and **10**) in the housing elements **14** and **15**. The front face of the end section **16** includes a pair of screws **59** for retaining the entire assembly **10** within an appropriate chassis or frame.

A plurality of switch-contact elements **60** of the type illustrated in FIGS. **11** and **12** are disposed within the side housing members **14** and **15** for cooperation with the corresponding contact pads **36, 38, 39, 40** and **44** (FIGS. **4** and **5**) on the printed circuit board. Each of the switch-contact elements **60** of the present invention is an elongated spring element and includes a rearward end section **61**, a first or contact portion **62** adapted for electrical engagement with a first contact pad on the printed circuit board, an elongated intermediate section **63**, a second or switch portion **64** adapted for selective electrical engagement with a second contact pad on the printed circuit board and a third or contact portion **65** adapted for electrical engagement with a contact element on the patch plug **18** (FIGS. **1** and **3**) when the plug is inserted into the patch module **10**. Each of the first, second and third portions, **62, 64** and **65** respectively, includes a curved or humped portion and is electrically connected with the others. As shown in FIG. **12**, the portions of the switch-contact member **60** in the area of the portions **61, 62, 64** and **65** are bifurcated. The purpose of this bifurcation is to provide independent movement of the bifurcated portions at the points of contact. This assures electrical contact at such points even if one of the bifurcated portions is prevented from doing so because of contamination or a dislodged particle at the point of contact.

The particular relationship between the elements **60**, the printed circuit board **13** and the side housing members **14** and **15** is best seen by reference to FIGS. **6, 7, 8** and **9**. With specific reference to FIG. **6** it can be seen that the first or contact portion **62** of each of the elements **60** in section **43***a* (FIG. **9**) is in electrical engagement with a corresponding contact pad **36** disposed on the surface of the printed circuit board **13**. The element **60** is retained in this position by the edge **66** which is disposed within the humped portion **62** and the ribs **68** and **69**. A means for biasing the element **60** toward the circuit board **13** in the form of a cylindrical spring stress pin **72** is positioned between a pair of supporting edges **70** and **71**. This pin **72** causes stress in the elongated intermediate portion **63** of the member **60** which forces

it in a direction toward the printed circuit board **13** to insure good electrical engagement between the portions **62** and **64** and their associated contact pads **36** and **39**. As illustrated in FIG. **9**, a stress pin **72** is provided in each of the bays **43***a*, **43***b* and **43***c* and is disposed at right angles with respect to the switch-contact elements **60**.

The second or switch portion **64** of the element **60** is adapted for selective electrical engagement with the contact pad **39** disposed on the surface of the printed circuit board **13**. The third or contact portion **65** of the element **60** is adapted for electrical engagement with a corresponding contact element **78** associated with the patch plug **18**. As shown in FIGS. **6** and **11**, the third portion **65** includes a humped or curved portion disposed toward the printed circuit board **13** to insure good electrical engagement with the contact element **78**. The relationship between the switch-contact element **60** and the patch plug **18** is such that when the patch plug **18** is properly inserted within the patch module **10**, electrical engagement is made between the third or contact portion **65** and the contact element **78**. This insertion of the patch plug **18** also results in movement of the portion **65** away from the printed circuit board **13**, thus also resulting in movement of the second or switch portion **64** out of electrical engagement with the contact pad **39**.

The forward ends of each of the side housing members **14** and **15** include a forwardly extending portion **52**, a rib section **54** extending at generally right angles with respect to the elements **60** and an inwardly extending end portion **57**. The patch plug **18** includes a peripheral portion **74** encircling the set of contact elements **78**. A recessed section **75** is formed within the portion **74** for engagement with the rib **54** upon insertion of the patch plug **18** into the patch module **10**.

As shown in FIG. **6** and also in FIG. **13**, the patch plug **18** includes a plurality of contact elements **78** adapted for electrical engagement with corresponding switch-contact elements **60** in the patch module. Each of these contact elements **78** is electrically insulated from one another by an insulated portion **76**.

It should be noted that in the preferred embodiment, each of the switch-contact elements **60** is constructed of a spring metal so that the stress caused by the stress pins **72** causes the contact and switch portions **62** and **64** to engage the corresponding contact pads associated with the printed circuit board **13**. It is contemplated, however, that alternate embodiments could be constructed from relatively stiff or rigid material and still obtain the benefits of the present invention. For example, as illustrated by the schematic of FIG. **14**, if the switch-contact element **60** were relatively rigid, the stress force could be provided by a spring element **81** biasing the switch-contact element toward the printed circuit board **13**. In such embodiment, insertion of the patch plug **18** would cause the third or contact portion **65** of the element **60** to be moved away from the printed circuit board **13** against the force of the spring element **81**, thus electrically disconnecting the portion **64** from the contact pads **39**. An important feature of the above structure which continues to exist, however, is the electrical contact between the portion **65** of the switch-contact element **60** and the contact element **78** of the plug **18**.

It is also contemplated that a further embodiment could be constructed as illustrated in FIG. **15** in which the electrical engagement between the contact element in the patch plug **18** could be made with the outer surface of the third portion **65**, thus causing movement of the third portion **65** toward the printed circuit board **13** upon insertion of the patch plug **18**. If a fulcrum or other pivot point **82** is provided between the contact portion **65** and the switch portion **64**, downward movement of the contact portion **65** as a result of insertion of the plug **18** will result in upward movement of the switch portion **64** and thus electrical disconnection between such portion and the contact pad **39**. In both of the above possible alternate designs, electrical contact is made between the contact element **78** in the patch plug **18** and a portion of the switch-contact element **60** rather than between the contact element **78** in the patch plug **18** and a contact pad on the printed circuit board as in the prior art.

It should be noted that although only one of the switch-contact elements **60** has been described in detail, the patch module **10** includes a plurality of such elements in each of the bays or sections **43***a*, **43***b* and **43***c* (FIG. **9**). Further, a set of the elements **60** and related structure is disposed on both sides of the printed circuit board **13** as illustrated in FIGS. **6**, **7** and **8**. Also, although the term patch module has been used to describe the present invention, its function is not limited to patching one set of leads to those of another. The patch module of the present invention is intended to include structures providing either patching or monitoring functions in addition to patching.

FIG. **15** is a schematic view of a further alternate embodiment of a switch-contact mechanism of the present invention.

Having described the preferred embodiment of the present invention in detail, the operation can be understood as follows. During normal operation of the patch module **10**, the leads **29** (FIGS. **4** and **5**) are electrically connected with the modem leads **30** via appropriate contact elements on the printed circuit board **13** and as a result of the various switch-contact elements **60** within the module. However, if it is desired to electrically connect the computer leads **29**, for example, with the modem leads of a second patch module, the patch plug **18** on one end of the patch cord **19** (FIGS. **1** and **3**) is inserted into the computer access opening **20** (FIG. **2**) and the patch plug at the other end of the patch cord is inserted into the modem opening **21** in the patch module containing the desired modem leads. As described above, when the plug **18** is inserted, electrical engagement is made between the contact elements **78** in the plug **18** and the contact portions **65** of elements **60**. This engagement causes the portions **65** to be moved outwardly away from the circuit board **13**, thus also resulting in electrical disengagement between the second or switch portion **64** of the switch-contact elements **60** and the contact pads **39**. This results in electrical disconnection between the leads **29** and **30** of the same patch module.

Although the description of the preferred embodiment has been quite specific it is contemplated that various modifications could be made to the present invention without deviating from the spirit of the present invention. Some of these alternate embodiments have been suggested in the above description and drawings. Accordingly it is intended that the scope of the present invention be dictated by the appended claims rather than by the description of the preferred embodiment.

I claim:

1. A patch module usable with an insertable patch plug having at least one electrical contact element, said patch module comprising:

a circuit board;

a first electrical circuit electrically connected with a first point on said circuit board;

a second electrical circuit electrically connected with a second point on said circuit board, said first and second points being electrically insulated from each other; and

switch-contact means for selectively making electrical connection between said first point and said second point and for making electrical connection between said first point and the electrical contact element of said patch plug upon insertion of said patch plug into said patch module, said switch-contact means having a first portion electrically engaged with said first point, a second portion adapted for selective electrical engagment with said second point and a third portion adapted for limited movement relative to said circuit board for electrical engagement with the electrical contact element of said patch plug as a result of insertion of said patch plug into said patch module, said first, second and third portions of said switch-contact means being electrically connected with each other.

2. The patch module of claim 1 wherein said circuit board includes a surface and said first and second points are disposed on said circuit board surface.

3. The patch module of claim 2 wherein said third portion is spaced from said circuit board and is adapted for movement away from said circuit board as a result of insertion of said patch plug into said patch module.

4. The patch module of claim 3 wherein said switch-contact means comprises an elongated spring element having said first portion disposed at one end, said third portion disposed at the other end and said second portion disposed between said first and third portions.

5. The patch module of claim 4 including bias means for biasing said first and second portions into electrical engagement with said first and second points.

6. The patch module of claim 5 including a housing connected with said circuit board for retaining and aligning said switch-contact means, said housing having an inner surface spaced from said circuit board surface.

7. The patch module of claim 6 wherein said bias means includes an elongated spacing member disposed between said housing inner surface and a point on said switch-contact means between said first and second portions and at generally right angles to said switch-contact means.

8. The patch module of claim 4 wherein each of said first, second and third portions includes a humped portion disposed toward said circuit board.

9. The patch module of claim 8 wherein said switch contact means is bifurcated at each of said first, second and third portions.

10. The patch module of claim 2 including a housing connected with said circuit board for retaining and aligning said switch-contact means, said housing having an inner surface spaced from said circuit board surface.

11. The patch module of claim 10 wherein said housing includes a plurality of ribs for aligning said switch-contact means.

12. The patch module of claim 11 wherein said first portion includes a humped portion disposed toward said circuit board and said housing includes an edge disposed within said humped portion for limiting the movement of said switch-contact means within a longitudinal direction.

13. The patch module of claim 12 wherein said housing includes an end portion having a latching rib for latching engagement with said patch plug.

14. The patch module of claim 1 wherein said second portion is electrically disconnected from said second point as the result of said limited movement of said third portion.

15. The patch module of claim 1 wherein said first and second points include contact pads on said circuit board.

16. A patch and access assembly comprising a patch module and patch plug having at least an electrical contact element and being insertable into said patch module, said patch module comprising;

a circuit board;

a first electrical circuit electrically connected with a first point on said circuit board;

a second electrical circuit electrically connected with a second point on said circuit board, said first and second points being electrically insulated from each other;

switch-contact means for selectively making electrical connection between said first point and said second point and for making electrical connection between said first point and the electrical contact element of said patch plug upon insertion of said patch plug into said patch module, and switch-contact means having a first portion electrically engaged with said first point, a second portion adapted for selective electrical engagment with said second point and a third portion adapted for limited movement relative to said circuit board for electrical engagement with the electrical contact element of said patch plug as a result of insertion of said patch plug into said patch module, said first, second and third portions of said switch-contact means being electrically connected with each other; and

said patch plug including an insulated center portion having an outer surface and said at least one electrical contact element being disposed on the outer surface of said center portion.

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